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DIGITAL EQUITY IN BRAZILIAN EDUCATION: Obstacles in Rural Schools[1]

DIGITAL EQUITY IN BRAZILIAN EDUCATION: Obstacles in Rural Schools

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SUMMARY:

This article reflects on the obstacles to digital access and the use of Artificial Intelligence (AI) in Brazilian education, considering its applicability for teaching in rural schools. In order to understand the adequacy of this perspective in pedagogical processes, given the specificities inherent to the common purpose of the Rural Education Policy, there is a need for study. It is worth clarifying that the concern arises from this theme that was linked to the discipline of the Doctorate in Educational Sciences: Technological Innovations and Education, relating it to an object of study in the delimitation and foundation phase, which is linked to Rural Education. It is worth noting that the implementation of technologies needs to be accessible to those involved in educational processes. However, there are challenges related to its universalization in Brazilian education, which need to be dimensioned. Methodologically, the bibliographic review was used following the conceptualization of Marconi and Lakatos (2003; 2017). Regarding what refers to Artificial Intelligence, the reflective bases are: Viccari (2023); Tavares (2021); Coutinho (2020) and CIEB - TECHNICAL NOTES #16 ARTIFICIAL INTELLIGENCE IN EDUCATION (USP). From a temporal point of view, this study was carried out in the period of January 2025, in Asunción -Py, at the headquarters of the Universidad Del Sol. In the field of results, it was possible to outline that Brazilian education does not yet have the favorable conditions for adopting this perspective in educational processes, adequately, considering obstacles. **Keywords:**Digital Access. Artificial Intelligence. Rural Education. Teaching. Pedagogical Resources.

ABSTRACT

[1]Article prepared based on studies developed in the discipline of TECHNOLOGICAL INNOVATIONS AND EDUCATION, during the month of January 2025, taught by DR. DELFI LÓPEZ, which is part of the Doctorate course in Educational Sciences Stricto Sensu, linked to the Postgraduate Program Brazil of the Universidad Del Sol - UNADES PY.

This study examines the structural and pedagogical challenges associated with digital access and the integration of Artificial Intelligence (AI) into the Brazilian educational system, with a specific focus on its applicability in rural schools. Considering the guidelines of the National Rural Education Policy and the sociocultural and infrastructural specificities of this context, the research investigates the feasibility of AI as a pedagogical tool and the barriers to its implementation. The study originates from the discipline *Technological Innovations and Education*, part of the Doctorate in Educational Sciences, and is linked to an emerging research object in the process of theoretical and methodological delimitation. The methodological framework is based on a systematic literature review, following the approach of Marconi and Lakatos (2003; 2017), as well as the analysis of institutional documents and contemporary studies on AI in education. To support the discussion on Artificial Intelligence in teaching, the contributions of Viccari (2023), Tavares (2021), Coutinho (2020), and CIEB - *Technical Notes #16: Artificial Intelligence in Education* (USP) were adopted. The study was conducted in January 2025 at the headquarters of *University of the Sun* in Asunción, Paraguay. The findings indicate that the Brazilian education system still lacks the necessary infrastructure, effective public policies, and specialized teacher training to integrate AI technologies equitably and efficiently into educational processes. This issue is particularly critical in rural education, where access disparities are more pronounced.

Keywords: Digital Inclusion. Artificial Intelligence in Education. Rural Education. Educational Technologies. Public Policies.

ABSTRACT

This study analyzes the structural and pedagogical challenges related to digital access and the integration of Artificial Intelligence (AI) into the Brazilian educational system, with a specific focus on its applicability in rural schools. Considering the guidelines of the National Rural Education Policy and the sociocultural and infrastructural particularities of this context, the investigation examines the viability of AI as a pedagogical tool and the barriers that impede its implementation. The studio emerges from the discipline *Technological Innovations and Education*, belonging to the Doctorate in Educational Sciences, and is linked to an object of investigation in a process of theoretical and methodological delimitation. The methodological framework is based on a systematic review of literature, based on the conception of Marconi and Lakatos (2003; 2017), in addition to the analysis of institutional documents and contemporary studies on AI in education. To support it

discussion on Artificial Intelligence in the educational context, adopting the contributions of Viccari (2023), Tavares (2021), Coutinho (2020) and CIEB - *Technical Notes #16: Artificial Intelligence in Education*(USP). The investigation was carried out in 2025 at the headquarters of the*University of the Sun*, in Asunción, Paraguay. The findings indicate that the Brazilian educational system still lacks adequate infrastructure, effective public policies and specialized teacher training for the equitable and efficient integration of AI technologies into educational processes. This problem is particularly critical in rural education, where inequalities in access are more pronounced.
Keywords: Digital inclusion. Artificial intelligence in education. Rural education. Educational technologies. Public policies.

1. INTRODUCTION

The article addresses the disparity in access to technological resources, Artificial Intelligence (AI) in schools, highlighting how this inequality impacts student learning and educational equity. The reflection on the importance of equitable digital access in education aims to contribute to the construction of a more just society that is prepared for the challenges of the contemporary world.

The study developed here employed the bibliographic review method, with a view to studying secondary sources, which were chosen, following the following arguments: “Choice of Theme; Preparation of the work plan; Identification; Location; Compilation; Filing; Analysis and Interpretation; Writing” in accordance with the predictions of LAKATOS and MARCONI, (2003, pp: 87 – 93; 2017, pp: 55-63).

The discussion is based on the following issue: How does the disparity in digital access among students in Brazilian public schools in rural areas affect digital equity? The aim is to discuss the obstacles faced in promoting a more inclusive and egalitarian education, with a special focus on the reality of rural schools, ensuring that all students have equal opportunities in their academic development.

Its relevance lies in the urgency of addressing the issue of inequality in digital access in educational institutions. The increasing integration of technology in education has brought significant benefits, but it has also exposed the existing differences between students who have full access to digital tools and those who face barriers in this regard.

For Blikstein,

> "equity in digital education seeks to ensure that all students, regardless of their socioeconomic or geographic background, have equal access to technological resources and benefit from the opportunities offered by educational technology" (2013, p.10).

For the author, it is essential to reduce the so-called "digital divide" to ensure a more inclusive and fair education that truly prepares students for the challenges of the 21st century. This requires the implementation of educational policies and practices that ensure equal access to technology, providing all students with the same opportunities for learning and growth.

This time, with regard to schools located in rural areas, this technological immersion is even scarcer, the obstacles to access and, consequently, use of AI, in which students in these contexts are immersed are even more emphasized in the disparity of resources offered to Brazilian public schools, considering their distance from municipal headquarters (urban areas).

Therefore, regarding the benefits that the use of AI can provide in the teaching process, when mediated as a facilitator of learning, considering the disparity in access to technological resources, it creates a digital divide that widens the inequalities that already exist in the Brazilian educational system.

The discrepancy in the availability of digital resources negatively impacts the quality of education offered in public schools, hindering digital inclusion and the promotion of more comprehensive training aligned with the demands of today's society.

Therefore, it is suggested that effective public policies be adopted that promote investments in infrastructure, teacher training, provision of digital educational content, and relevant resources that facilitate learning. This is a proposal for a possible reduction in the disparity in digital access and the promotion of a fairer and more inclusive education for students, regardless of their territorial context. Although, according to Pinto (2005), it is understood that the use of technology goes far beyond digital resources, since everything that is innovative in teaching practice or in any area of service provision is in fact technological advancement, given that digital technology only exists through human intelligence.

2. THEORETICAL FRAMEWORK

2.1 DIGITAL ACCESS INTERFACES AND THE USE OF AI IN RURAL SCHOOLS IN BRAZIL

The technological advances observed in various sectors and services, corresponding to their institutional routines, have taken into account the current reality in developed countries, which ends up driving the adoption of procedures common to social interactions worldwide. In view of this advance, Artificial Intelligence (AI) is being used for the development of products and services in various sectors of societies, which already live with this reality, and there are others that need to follow a path to implement it. It is noted that transformations are becoming increasingly evident.

And in view of this, education is also influenced. Although, it is necessary to study the structuring conditions so that changes are viable, taking into account the panorama of Public Policy of the Brazilian State and, in its federative units, without losing sight of its municipalities.

In the context of Artificial Intelligence: AI is the core of the challenges of Brazilian Public Education, which need to be dimensioned so that it is possible to characterize reality, think about its understanding and, in turn, develop possible interventions that enable the adoption of new strategies that will favor the guarantee of the construction of quality education from the point of view of its universality.

Based on these two poles, this study initially considered determining the considerations regarding digital access in rural schools that derive from the proposal for digital inclusion regarding the use of Artificial Intelligence and, for this, it is worth recording the perception conceived by Bates: [...] “mental processes used in human learning” (2017, p. 87). In this same context, Haugeland (1985) cited by COUTINHO conceptualizes AI as “The effort to make computers think... machines like humans, in their full and literal sense” (2021, p. 25). Still, based on this premise, Bellman (1978) cited by CIEB (2019, p. 06) states that AI is “The automation of activities that we associate with human thought, activities such as decision making, problem solving, learning...”

In this way, the authors cited understand AI as any digital representation of human thought, capable of facilitating, as well as speeding up and enhancing the execution of tasks or services.

This reality has been recorded for a long time, as Viccari (2023) points out, outlining an overview of the use of AI in the world and, later, in Brazil, allowing us to reflect on how gigantic the trajectory of this service offering is. In Brazil, between 1950 and 1970, new forms of work were created, due to the demand for new technologies, a time when the country was also experiencing the industrial revolution, a historically known process that required the creation of other forms of knowledge and other forms of production. This theme was not well absorbed in Brazil, as two decades later it was still considered an exotic subject, as can be seen.

> It is no wonder that the first wave of AI tools for education was mostly produced in the United States. In Brazil, between the 1980s and 1990s, AI was considered an "exotic" topic, while in countries such as the United States, China and England, research on the subject was popping up. "So much so that today the main AI products we use come from the USA. China also produces a lot, but we do not have such broad access to its products" VICARI, (2023, p.1)

It is possible to perceive in the authors' view that technology and consequently its benefits are something considered below the Brazilian social reality. A reality designed in the long term. Therefore, the disparity of Brazilian digital inclusion is merely a reflection of the social divergence established in the most varied contexts, being an incidence even more immersed in rural communities, given the weaknesses established in the interfaces of schools such as: infrastructure, geographic location, lack of resources, among other factors that unfortunately highlight the deficiency in the provision of Brazilian education.

It is observed that AI has promoted a giant revolution in the global economy, providing opportunities for the creation of processes to facilitate the interactive dealings of goods and services, in all sectors, as well as in the educational field. "However, despite the impact of these changes on our society, educational activities still adopt technology at a slow pace" (Tavares; Meira and Amaral, 2020, p.3), especially with regard to the teaching process offered for the initial years, in the context of rural schools, which are not always well advised in their entirety, by the action of congruent public policies, making clear the fragility of current actions.

Thus, it is pertinent to think that they need to be carried out in the field of Brazilian education, regarding digital access and consequently the use of AI in pedagogical actions and processes, as they are of fundamental importance, since they will make it possible to set goals and guide mechanisms, which emulate interactive activities, in order to make the

teaching process in a satisfactory manner, enhancing the teaching work, as well as enhancing the students' understanding. Obviously, without losing sight of the concepts very well advocated by Pinto (2005), in a perspective of adding curricular skills linked to the human aspect, with ethics and responsibility, teamwork and flexibility, thinking skills, understanding that everything that is produced in innovation is in fact a technological production, and, according to the Center for Innovation for Brazilian Education - (CIEB) culminating in (critical thinking, problem solving and creativity) primordial values for society.

2.2 INFLUENCE OF AI ON BRAZILIAN EDUCATION

AI has been increasingly used in teaching processes in Brazil. This teaching tool certainly gained greater prominence during the COVID-19 pandemic. A reality that was experienced worldwide, those who were antipathetic to this tool had to surrender to the benefits it brought us, in terms of distance learning. This pedagogical strategy had to be adopted to facilitate communication between students and educators who were prohibited from participating in face-to-face classes.

Thus, given the huge demand presented, due to the necessary distancing of people and aiming at the possibility of adopting mechanisms to facilitate pedagogical processes, AI will gain greater space in the educational context.

Obviously, this tool has already been used in various sectors of production and social services, including in the educational context, but unfortunately in a more restricted way to the general public. Thus, there is a need to think and rethink public policies to meet this demand. Given that AI can and should be used as an indispensable tool in various sectors of human life, in all social contexts and especially in educational contexts, when digital literacy must be considered, thinking about the adoption of public policies that involve true digital inclusion.

Digital access is already a reality in different scenarios, and is a strong ally of educational institutions, especially in the daily lives of students and educators. In this context, we must consider the social dichotomy in which, unfortunately, we see that this access is not achieved equitably in all contexts. There are great challenges in understanding to what extent Brazil is or is not prepared.

to offer the population qualified education using AI, given that the rural schools mentioned in this study do not even have decent digital accessibility.

For the Center for Innovation in Brazilian Education (CIEB), a non-profit organization whose mission is to promote a culture of innovation in public education, stimulating an ecosystem that generates solutions so that each student can reach their full learning potential, "[...] AI can play a major role in the field of Education if it is used to support the teaching and learning process." (CIEB, 2019, p. 05) And, it was possible to see in this investigation that AI has in fact taken on this role, given that, every day, teaching demands resilience and innovation among peers from all actors that make up the school community, when it comes to the act of teaching and learning.

Based on this premise defended by CIEB, it is interesting to list some principles necessary for the adoption of Artificial Intelligence in Brazilian education, which were defined by CIEB itself, such as: 1) training pedagogical actors for the appropriate use of AI; 2) preparing the data collection infrastructure; automating administrative activities; 3) using data to inform pedagogical actors about the state of the educational ecosystem; 4) using Artificial Intelligence in Education (AIED) to enhance the capabilities of pedagogical actors; 5) using AIED to reform the institution and the curriculum; 6) promoting inclusion and equity through AIED and growing sustainably, using AIED to extract evidence of educational effectiveness.

Given the above, it is pertinent to reflect on whether Brazilian education actually has the implementation of public education policies that support the Brazilian educational process in all social contexts? To answer this question, one can think and affirm, based on what is observed in educational institutions, that unfortunately they do not. They are not prepared, because the economic diversity evident in Brazil presents a distinct scenario in which many schools still do not have digital accessibility. They do not have the material, financial and human resources that would enable the use of certain learning facilitators. They also do not offer educators adequate training for handling AI in the concreteness of teaching.

For Tavares; Meira and Amaral (2020, p.4)

> Some examples of AI applications in education are: adaptive learning, intelligent tutors, diagnostic tools, recommendation systems, learning style classification, virtual worlds, gamification and data mining applied to education.

As these authors point out, adaptive learning is important[2]. However, it cannot be required that all teaching in Brazil have mediators who practice adaptive learning, since there are still schools that do not have the physical and formative resources necessary to establish the process versus student relationship, as well as the teaching process and the act of learning. In this sense, the authors add

> [...] characterize as adaptive the ability of a system to identify user preferences or characteristics and, based on this information, customize its tasks. In the pedagogical context, adaptive learning aims to use technology to meet the individual learning needs of students. (TAVARES; MEIRA AND AMARAL (2020, p.05)

Thus, with regard to the Brazilian educational process, evidenced by the comprehensive need for digital mechanisms, as the only current way to make learning successful, it emphasized, concomitantly, the gigantic lack of schools in terms of offering resources for the new way of teaching and, above all, learning.

Education in Brazil therefore lacks Information and Communication Technologies (ICTs) to mediate teaching work and, therefore, the educator, in turn, needs training compatible with our demand.

In rural schools in small Brazilian municipalities, this reality was, and still is (post-pandemic). Schools continue to lack resources and subsidies to facilitate the teaching process. Since such resources are almost non-existent and, when they do arrive, they arrive late.

It is understood that it is necessary and pertinent to reflect on this theme, in order to seek new paths for the concreteness of equitable education, with a view to adopting motivating education, using ICTs appropriately, as well as offering assertive public policies to manage and mediate the entire process.

2.3 DIGITAL RESOURCES IN BRAZILIAN SCHOOLS

In Brazil, the National Common Curricular Base BNCC (2017) itself already emphasizes, in its fifth general competence, the importance of teaching work in the face of

[2] Adaptive learning is a way of teaching that focuses on the needs, goals and profile of the student. This methodology takes into account each student's difficulties and focuses efforts on what is most important at the moment.

teaching process, highlighting the importance of this also being offered through digital technologies, understanding its relevance in the educational process.

> Understand, use and create digital information and communication technologies in a critical, meaningful, reflective and ethical way in various social practices (including school practices) to communicate, access and disseminate information, produce knowledge, solve problems and exercise protagonism and authorship in personal and collective life (2017, p.11).

However, the reality of Brazilian schools is still far from being considered ideal for the implementation of qualified education. Brazil, despite being very rich in culture and natural resources, is still characterized as an underdeveloped country, lacking major advances in the implementation of public policies already in force. In light of the personal reflection thus highlighted, it is pertinent to ask what does a country as giant by nature as Brazil need to have quality education?

This is a very pertinent question to discuss the innovative action of Digital Inclusion in Brazilian schools. A necessary advance, but one that in Brazil is progressing slowly, with its lack of introduction, maintenance and use being highlighted during the COVID-19 pandemic. It is worth noting that, even after all the deficiencies demonstrated during the pandemic process, most Brazilian schools still do not have the technological resources to implement AI-mediated teaching in the classroom. There is a lack of digital connection and obviously machines (physical resources) so that the educator can use ICTs, adapting school activities to work with the student in a more playful and enjoyable way.

Furthermore, the lack of specific training is also emphasized so that teachers can immerse themselves in the content using digital mechanisms, since digital resources ensure greater engagement in interactive classes for students who, in turn, learn the curricular content from a more playful perspective, for example, through digital games. However, it is important to emphasize that any and all innovation is configured as technological innovation, which is a concept with secular support, since the art of creating and innovating gradually guarantees humanity resilience in the professional and personal fields.

It should be noted that digital technologies are important tools in education, but that any and all teaching dynamics in the teaching process are a great achievement in the exercise of teaching. It is therefore important to clarify that it is not a lack of interest on the part of the teacher to seek his/her

professional qualification, but rather a lack of motivating educational policies that concern teacher training in practice.

In this regard, CIEB states that:

> [...] before thinking about introducing AIED, it is vital to train the actors in the educational ecosystem in question (students, teachers and managers) so that they understand what AI is, its capabilities, limitations and ways of applying it in education (2019, p.33).

With regard to education offered in rural schools, this absence of ICTs is even greater, a fact that may be explained by the welfare of current public policies, which often arrive even later in these schools. It is worth noting that the intention of this study, the investigation carried out, is not to criticize the public sector. Quite the contrary, the purpose is to suggest a reflection that in fact needs to be made, aiming to advance in terms of offering a better, more modern and more equitable teaching process in Brazilian schools. Understanding that digital access and consequently AI have a transformative potential that can reinvigorate Brazilian education, allowing educators to personalize their teaching method and adapt it to the individual needs of each teaching context.

In summary, this lists the main obstacles faced in promoting digital access in public schools in Basic Education, Initial Years, a common reality among educational institutions in the countryside, namely: precarious infrastructure; lack of teacher training; socioeconomic inequality of students; limited digital educational content; and insufficient investment. For Blikstein, “the lack of adequate financial investment in technological infrastructure and teacher training is a major obstacle to promoting digital access in public schools” (2021, p.9).

In the author’s view, one of the biggest challenges for digital inclusion in public schools in general is the lack of resources. This means that, without sufficient financial investment, schools are unable to acquire the necessary technological infrastructure (such as computers, quality internet networks, etc.) or provide adequate training for teachers to use these technologies. This “deficiency” in technology and scarce training limits access to and effective use of digital mechanisms in classes, compromising the preparation of students for an increasingly digital world.

In contrast to this, it is also worth considering the excessive use by students without any pedagogical purpose, and of course, evidently thinking about the context of schools that already have digital access (a reality that is more noticeable in schools

located in urban areas). Therefore, we see a digital generation, lacking physical social relationships, which often cause illness in ICT users, with regard to a worrying dependence on the part of students.

In view of this, it is known that technological innovation is perceived from a secular point of view, emphasizing the importance of stimulating students to the possibility of "creating", innovating and producing their own curricular knowledge in a favorable manner, with constructive purposes in relation to the teaching process. Therefore, the Federal Constitution itself highlights:

> Art. 213. "Public resources will be allocated to schools, and may be directed to community, religious or philanthropic schools, as defined by law, which:
>
> I – prove non-profit purpose and apply their financial surpluses to education (BRAZIL, 1988).

Also aligned with this point of view is LAW Nº 14.533, of January 11, 2023. Art. 1. Law that institutes the National Digital Education Policy (PNED), structured based on the articulation between programs, projects and actions of different federated entities, areas and government sectors, in order to enhance standards and increase the results of public policies related to the Brazilian population's access to digital resources, tools and practices, with priority for the most vulnerable populations. Making it clear that it is necessary to consider all educational contexts, and that subsidies for the teaching process must guarantee educational equity, also with regard to digital access and its technological benefits.

3. MATERIAL AND METHOD

This study was conducted through a bibliographic review, based on the analysis of academic productions, articles, books and institutional documents that address inequality in access to technological resources and Artificial Intelligence (AI) in schools, with an emphasis on the reality of institutions located in rural territories.

In view of this, the bibliographic review followed the methodological guidelines established by Lakatos and Marconi (2003, pp. 87-93; 2017, pp. 55-63), contemplating the following steps: choice of theme, elaboration of the work plan, identification, location, compilation, filing, analysis and interpretation, culminating in the writing of the article. This method allowed a systematic and in-depth approach to the research problem, providing

a comprehensive understanding of the challenges faced by rural schools when it comes to digital inclusion and the implementation of AI in education.

It is also clarified that the selection of materials considered criteria of relevance, timeliness and pertinence to the topic, prioritizing academic and institutional publications that discuss digital equity, technological inclusion and public policies aimed at rural education. The documents analyzed were organized into thematic categories, allowing the identification of patterns and gaps in the existing literature.

Furthermore, the approach used in this study allowed us to establish a critical overview of the disparities in digital access in rural public schools, as well as to identify challenges and possible solutions to minimize this inequality. The methodology adopted reinforces the importance of academic discussion on the topic, contributing to future research and the formulation of more inclusive educational policies.

4. RESULTS AND DISCUSSION

The results obtained from the literature review indicate that the disparity in access to technological resources and Artificial Intelligence (AI) in rural schools directly impacts educational equity. The literature analyzed reveals that the lack of adequate infrastructure, such as access to quality internet and technological equipment, compromises the insertion of these students in the digital universe, widening the gap between urban and rural education, which is also commonly forged in exclusionary stereotypes regarding Rural Education.

Several studies have shown that, while urban schools are more likely to be subject to more robust public policy investments in educational technology, institutions located in rural areas face significant limitations, both in terms of physical resources and in the ongoing training of teachers in the pedagogical use of AI. This inequality is reflected in the development of students' digital skills, reducing their opportunities to participate in innovative educational practices and limiting their preparation for a job market that is increasingly dependent on technology.

The literature review highlights the need for effective public policies that prioritize digital equity, including investments in connectivity, acquisition of technological devices and teacher training. Furthermore, it is observed that the implementation of AI in education, when well structured, can function as a means of reducing

inequalities, offering personalized support for students in different socioeconomic contexts.

Thus, the results show that the lack of adequate technological infrastructure in rural schools reinforces the historical barriers of digital exclusion, making it urgent to adopt measures that promote greater technological inclusion. The discussion raised suggests that overcoming these challenges requires a joint effort between governments, educational institutions and civil society to ensure that all students, regardless of their location, have equal opportunities in accessing education mediated by technological resources.

FINAL CONSIDERATIONS

Based on this study, it is clear that initiatives aimed at reducing inequalities in digital access in Brazilian public schools, especially those located in rural areas, are urgently needed. To this end, investment in technological infrastructure, teacher training and the creation of policies that ensure digital equity are essential to overcome educational barriers and ensure that all students, regardless of their geographic and socioeconomic context, have the same opportunities for learning and development.

As pointed out throughout the article, the inclusion of technologies such as Artificial Intelligence in the school environment can act as a facilitator of learning, promoting an education that is more aligned with the technological demands of the 21st century. Thus, by ensuring equitable digital access, we contribute to the construction of a more just and democratic society, where everyone has the chance to participate and thrive in the contemporary digital landscape.

Therefore, the points discussed are reinforced and the need for a joint effort to create a more egalitarian educational environment, aligned with the current technological context, is highlighted. Given that this tool actually enhances and puts into practice human creative thinking, as this research has revealed. And these transformations are carried out throughout the entire process of educational development.

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